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ABSTRACT

Environmental education is mandatory in the New South Wales, Australian curriculum and yet the research to date shows that while some teachers include environmental education in their programs, many do not. It is argued in this paper that the problems in environmental education require research for their solution. This paper intends to make a contribution to such research and thereby contribute to an improvement in the teaching and learning of environmental education. This paper reports on one teacher's self-study of teaching practices as informed by students involved in teacher education and by these students' experiences in the classroom. The paper discusses theories were tested and eventually used to build a more adequate theory. It explains how initially a socially critical theory was adopted as the preferred theory to solve problems identified, but that during the course of the study it was realized that while socially critical theory was useful in identifying problems it did not provide solutions to the problems. To this end the paper discusses the adoption of a problem-based methodology (Robinson, 1993) which provides both a research methodology to investigate practice and intervention strategies to assist teachers in solving their professional problems. (Author/MA)

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REFORMING ENVIRONMENTAL EDUCATION: A FORKED ROUTE

ED 460 838

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This paper is part of the interactive symposium

SELF-STUDY ON THE ROAD TO REFORM IN TEACHER EDUCATION:

OBSTRUCTIONS, DETOURS AND RINGROADS

Self-study of teacher Education Practices SIG

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Reforming Environmental Education: A Forked Route

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Abstract

Environmental education is mandatory in the NSW, Australia curriculum and yet the research to date shows that while some teachers include environmental education in their programs, many do not. It is argued in this paper that the problems in environmental education require research for their solution. It is my intention to make a contribution to such research and thereby to contribute to an improvement in the teaching and learning of environmental education. Therefore, as an educator of teachers, specifically in the field of environmental education, I am concerned that I should research my own practices with the aim of contributing to an improvement in the teaching and learning of environmental education. In this paper I report on my study of my practices as informed by my students involved in teacher education and by these students' experiences in the classroom. I discuss my theories of environmental education, how I tested these theories and eventually built a more adequate theory. I will explain how I initially adopted socially critical theory as my preferred theory to solve the problems I had identified, but that during the course of the study I realised that while socially critical theory was useful in identifying problems it did not provide solutions to the problems. To this end I adopt a problem-based methodology (Robinson, 1993) which provides both a research methodology to investigate practice and intervention strategies to assist teachers in solving their professional problems.

The study reported in this paper emerged from a concern that despite twenty years of theorising about the practice of environmental education in schools little was actually occurring in schools. The educational problem I set out to solve was how to improve the teaching and learning of environmental education in primary schools in Australia. One method I employed to investigate this problem was to study my own practice as a teacher educator and specifically as an educator in the field of environmental education. The method I employed was to observe my students as practitioners in primary classrooms. I also asked my students to reflect on their experiences as a student in my classes. This examination of my practices has led to a testing and eventual

modification of my theories of teaching and learning environmental education, as my self-study indicated that I needed to revise my theories of practice (see also Schuck, 1999; Segal, 1999).

Self-study

Self-study of practice involves the examination of one's own practice in order to improve practice (Friesen, 1997:2). The assumption is made in this paper that the practitioner (in this case the teacher educator) is capable of making a difference and that their practice is not so constrained by broader institutional constraints that they are unable to improve practice (see Friesen, 1997:4).

According to Myers (1995:4) university scholars, including teacher educators, engage in the construction of academic knowledge and not knowledge of practice. He explains that scholars develop and test theories in the academic context but do not test their theories in their own educating of teachers. According to Myers (1995:4):

> As academic knowledge, the knowledge they construct is validated by how well it is thought through, how well it is grounded in accepted theory, how congruent it is with accepted bases of knowledge, how well it is accepted by scholar peers, and if and where it is published. It is not validated by practice.

Myers believes that useful knowledge is gained through knowledge of practice, and specifically their own practice. Such knowledge is gained to improve practice. This type of knowledge can be threatening since the self-study can be tested publicly. Myers also claims that without an understanding of the knowledge of practice, the constraints of change will be such that the problem cannot be solved.

Indeed, Robinson (1998:17) claims that the reason for the limited contribution of research to the improvement of educational practice is the mismatch between educational research methodologies and practice in educational settings. She claims that practices should be viewed as solutions to practical problems and can be explained by inquiry into the problem-solving processes that gave rise to them. She offers a problem-based methodology (PBM) as a means to analyse practice.

Clearly educational research should contribute to the solution of educational problems. Improved practice should result (Robinson, 1993). The ultimate test, therefore, of the validity of the knowledge gained through self-study is determined by how much such knowledge improves practice (Friesen).

The issue for researchers engaged in self study is how to give an adequate account of their practice. Indeed this is an issue for any researchers investigating practice. According to Robinson (1998:18) an adequate account of practice must meet several conditions. The first condition is that the researcher must show how practices are context dependent. Secondly, the researcher must show how practices are theorised by the practitioner. In the case of self-study the practitioner is also the researcher. Thirdly, an account of practice must show that practices can be at times automatic and other times deliberative. Fourthly, an account of practice must explain why a certain practice is adopted and take account of the judgements made by the practitioner about the adequacy of alternative practices. In other words the researcher must explain why a practitioner chose one practice in preference to other practices. For the researcher engaged in self study this action requires an examination of their preferred theory of practice in relation to other relative theories of practice. Fifthly, an account of practice must show how judgements of their adequacy change over time.

Understanding Personal Theories of Teaching and Learning

I am arguing in this paper that in order to solve educational problems it is necessary to understand personal theories of teaching and learning. Argyris and Schon (1974: 6) refer to practitioners' theories as `theories of action'. They explain:

A theory of action is a theory of deliberate human behaviour, which is for the agent a theory of control but which, when attributed to the agent, also serves to explain or predict his (sic) behaviour.

Robinson (1993a) claims that theories of action tell us the meanings, values and purposes behind people's actions and that practitioners use their theories to understand and solve practical problems. Yaxley (1991: 6) further claims that practitioners' actions are intentional which means that activities carry with them purposes or intentions. Yaxley claims that: 'Teaching is about intentional action which leads to changes in belief, value and meaning.' Problems are solved by the strategies prescribed by theories of action.

Theories of action consist of espoused theories, or theories that we hold and can consciously articulate, and theories-in-use which are implicit in the actions that actors engage in and which can be observed. A practitioner may not be able to articulate their theory-in-use, or even be aware of it.

A theory of practice is a set of interrelated theories of action that specify what actions will probably occur (Argyris and Schon, 1974). Theories of practice provide practitioners with a reference point

from which to judge the validity of their theories. As a tertiary educator in teacher education I provide my students with a theory of the practice of primary school teaching. My students use this theory to judge the validity of their theories and perhaps revise their theories. The study reported in this paper provided me with the opportunity to test, evaluate and revise my theory of practice.

As practitioners, educational policy makers and educational researchers we are not always aware of our theories of teaching and learning. The research situation provides the opportunities to reflect on and articulate our theories. I found that as I interviewed the practitioners in the study they reflected on their own practice. They articulated their theories, justifying them at times and at other times questioning them. The interview situation provided practitioners with the opportunity to articulate their problems and in some instances this process provided them with the opportunity to articulate a solution to their problems. This process also allowed me the opportunity to test my theories.

Problem-based methodology, as designed by Robinson (1993), is a methodology which treats practices as solutions to practical problems and these solutions are explained by an inquiry into the problem solving process that gave rise to them. PBM involves the reconstruction of theories of action and the development, implementation and evaluation of an alternative theory of action. In many cases problems cannot be solved without challenging and changing core values and beliefs. In this situation a solution requires major changes to the assumptive framework that practitioners bring to the problem. Here, I am talking about transformation of the individual within existing institutional structures. Robinson (1993a: 17), in reference to Argyris and Schon (1974: 18-19), describes this as second-order change or what is referred to as 'double-loop' learning. Single-loop learning, on the other hand, does not require major changes to the assumptive framework.

In the situation where a problem solution requires the challenging of core values and beliefs double-loop learning is required. I am arguing that in the study reported in this paper I needed to challenge my core values and beliefs about the practice of teaching environmental education in schools. Robinson explains that if a better theory is required it is necessary to change the values, goals and key assumptions that make up a person's constraint structure, or in other words the conditions of their practice (Robinson, 1993a: 42). This paper describes how I engaged in double-loop learning.

Background to the Study

The study emerged from my concern about the practice of teaching environmental education and the contribution of educational research to improving the teaching of environmental education. I consider that educational research should contribute to improved practice for teachers and improved learning for students. The study involved two phases, each phase contributing to an understanding of the teaching of environmental education and an understanding of how my own practice contributes to an improvement in the teaching and learning of environmental education.

The research problem for the study was based on the hypothesis that the teaching and learning of environment in elementary schools in New South Wales, Australia, is inadequate. Two significant aspects to the problem were investigated:

1. How practice in schools can be improved. Here I was specifically concerned with practices which would lead to an improved education.

2. How my own practice as a tertiary practitioner and that of others could be improved. This aspect of the problem was inextricably linked to the first aspect of the problem as my students were current

or prospective school practitioners. I further hypothesised that improvement of my own practice would facilitate the improvement of practice in schools.

I argue in this paper that the problems of implementing environmental education have been identified but not solved. The desired changes are not happening in many schools. My own attempts to solve the problem of how environmental education can be important in the school curriculum explain, in part, why the changes are not happening. I will explain how I initially adopted socially critical theory as my preferred theory to solve the problems I had identified, but that during the course of the study I realised that while socially critical theory was useful in identifying problems it did not provide solutions to the problems. My story follows.

The Study

My main aim at the beginning of the study was to research practice in schools. I was also interested in knowing how my teaching in the tertiary institution was influential on the practice of teaching environmental education in schools. Clearly, the study was conceptualised, in part, as a study of my own practice. However, what I did not understand at the beginning of the study was that a self-study would lead to a testing of my theories of teaching and learning of environmental education and eventually to the adoption of a more adequate theory (see also Schuck, 1999). The theory testing occurred as I began to understand teachers' theorising of environmental education.

As explained earlier, the study was conducted in two phases. In the first phase of the study I researched my teaching with students in the tertiary setting. In the second phase I followed five of these into elementary schools in the Sydney region.

The first phase involved two groups of students participating in the Environmental Education subject at the University of Technology, Sydney. Four students from one group (part-time experienced teachers) and one student from the other group (full-time beginning teachers) then became involved in the second phase. Four of the five students were practising teachers, the fifth was a beginning teacher who gained a part-time position in a school at the completion of the subject. The second phase consisted of four case studies involving four primary schools (in one case there were two students from the one school).

In each case study key practitioners sought to improve the teaching and learning of environmental education in their respective schools. Their common aim to improve the implementation of environmental education in the school curriculum was later articulated as different sets of constitutive problems.

The research methods I used in Phase I were qualitative and interpretive. They involved an analysis of the transcripts of lectures, discussion groups and student work. I was asking whether:

- there were any indications of personal changes in students' values and attitudes during the semester;
- students were indicating a preparedness to take action on environmental issues;
- there were constraints in implementing a curriculum which included environmental education;
- the objectives of the subject were being met; and,
- whether these objectives were appropriate.

My dual role as practitioner and researcher had the potential to be problematic. It was essential that the students be fully informed of the research and that their agreement to participate in the study be

sought at the beginning of the semester. Frequent checks were made to ensure that they were comfortable with the agreement and permission to tape was sought from them at the beginning of each session. Students were not interviewed individually until the semester had finished and assessment was completed. Similarly, pieces of work which were submitted for assessment were not analysed until results were known to the students. Feedback was regularly provided to students and feedback sessions proved invaluable in that they gave the students the opportunity to reflect on their own participation in the subject.

The team teaching approach taken in the subject provided me with an opportunity to reflect on my own practice and to check my reflections with my partner from the Science Department. We constantly monitored our teaching and the manner in which our students participated in the subject, matching our observations with our objectives. All teaching episodes were co-managed, planning was collaborative and students' work was assessed by both lecturers. This team teaching approach to the teaching and assessing of the subject provided the opportunity to confront the ethical questions raised by my dual role as teacher and researcher. These questions were solved through the checking system established with my co-teacher. In other words through the co-management of all teaching episodes and collaborative assessment of student work my co-teacher assumed the responsibility of monitoring my interactions and assessment of students. This process ensured that no student was disadvantaged by their involvement in my study and nor were students not directly involved in the study disadvantaged.

The subject purposes remained constant throughout the study. However, the teaching methodology was significantly adapted during the course of the study. The first significant changes were implemented after the data from Group 1 were collected and analysed. These changes principally involved the introduction of an action research model of investigating and taking action on an

environmental issue. The changes were implemented and evaluated with Group 3 and further changes involving the use of a problem-based methodology (Robinson, 1993) have since been made.

The second phase of the study consisted of a series of case studies using a multisite approach with knowledge accumulating across cases. My aim was to accumulate knowledge across the cases rather than develop a comparison between cases. Comparisons were made but only in the context of theory testing and theory building.

The qualitative data collected for the study came from a range of sources including interviews, observations, photographs and samples of both tertiary students' and primary school students' work. In order to create meaning from this large volume of data I identified classes of interests that focused on practitioners' problems and constraints and included, for example, crowded curriculum, perceptions of the principal, perceptions of other members of staff, perceptions of students, theories of teaching and learning, knowledge, professional development, school organisation and parent involvement. These classes of interest were represented in terms of the practitioners' and my own espoused theories and theories-in-use. I also identified practitioners' constraint structures.

Outcomes of the Study

The focus of this study was an analysis of practitioners' theories and my own theories. My aim was to understand practitioners' problems in schools and to use this understanding both to develop strategies for resolving practitioners' problems and to solve my research problem, 'How can I improve the teaching and learning of environment in primary schools?' As explained earlier, part of the process involved studying my own theories of practice and how such an understanding would inform practice in my institution and in schools.

Analysing my theories

I have an espoused theory that environmental education is important and should be included in the school curriculum. My actions indicate that this is also my theory-in-use. This is indicated in actions such as teaching environmental education to my experienced and preservice teacher education students, being active in the environmental education professional association and serving on many committees related to environmental education and environmental improvement.

Another espoused theory I hold relates to schools and the importance of environmental education in schools. My theory is that environmental education is not regarded as important in all schools, or perhaps even in many schools. My actions, to date, suggest that my theory-in-use coheres with both my espoused theories. In other words, environmental education is important to me and if I teach about environmental education, provide strategies for its implementation and work on committees to improve the profile of environmental education in the community then it would be important in schools.

I started the study with an espoused theory that socially critical theory was the most appropriate theory to bring about the changes I envisaged for environmental education. My theory influenced the content of lecture material presented to my students, my teaching methodology and means of student assessment. It also influenced the manner in which I conducted professional development programs for teachers. In developing my theory I was influenced by the literature in environmental education, much of which is grounded in socially critical theory (see, for example, Robottom, 1992; Hart, 1992; Fien, 1992; Huckle, 1991; Gough, 1987; Greenall-Gough, 1990).

Socially critical theorists claim that environmental education has a counter-hegemonic goal (following Freire, 1985), that environmental education requires practitioners to be conscientized to the transformative nature of the field and to adopt the more progressive socially critical curriculum theory (Fien, 1992). Theorists such as Robottom (1987) claim that practitioners need to critically appraise their practice through action research. This critical appraisal will lead practitioners to reform their practice and in turn lead to program and institutional improvement.

However, I became increasingly frustrated with my espoused theory and upon reflection it is evident that I also held the contradictory espoused theory that socially critical theory could not solve the educational problems I had identified and specifically those related to the implementation of environmental education in the school curriculum. I now argue that socially critical theory does not provide a practical theory of change that will lead to problem resolution in the current structures of school education. A significant issue is that teachers' constraint structure is not accommodated adequately in the theory. The constraint structure consists of the conditions that are present in practitioners' organisational and interpersonal life. It is important that practitioners' problems are solved either within their existing constraint structure or by providing them with the skills to change their constraint structure.

I found it increasingly difficult to assist my students in developing their own practical solutions to the problems they identified in schools. My students were left without a theory of change that provided solutions to practitioners' problems and dealt with practitioners' perceived constraints. I believed that I needed a more appropriate theory which would accommodate the context of teaching.

Other contradictions emerged between my espoused theories. Historically, environmental education as a field of study has been informed by a set of theories which include empiricist theories often

related to the sciences. Solutions to educational problems and specifically those related to environmental education must take account of the range of theories, including empiricist theories, that inform the field (K. E. Walker, 1996). Socially critical theorists reject positivism and in so doing reject the so called 'positivist theories', such as empiricism, which have commonly been related to the sciences

It was evident to me at this stage that my theory of environmental education could not be effective. If the theory was to be effective it would violate important constraints - in this instance the structures of school education. One could argue that this is a positive action, however, the theory would have to be accompanied by a theory of change and an implementation theory. Socially critical theory does not provide a practical theory of how the structures of school education can be reformed. In the absence of an adequate theory of change the theory of environmental education that I was presenting to my students was ineffective.

I have now become more attracted to theories that provide solutions to the contradictions between my espoused theories. The problem of the contradictions in my espoused theories has been solved by identifying a theoretical framework (K.E. Walker, 1996) which included a coherentist epistemology, a touchstone approach (J.C. Walker, 1985) to theory development and a problem-based methodology (Robinson, 1993). This theoretical framework provided strategies that allowed me to explore solutions to practitioners' problems through a better understanding of my practice and the practice of the teachers in my study.

Learning from practitioners

The study allowed me to have a better understanding of practice in schools and these understandings informed my own practice as a tertiary educator. Another way of explaining this process is that I

engaged in theory building. In other words I tested and revised my theories and in so doing developed better theories that are more able to explain practitioners' problems. Argyris and Schon (1974: 158) explain that building one's own theory of practice involves diagnosis, testing and accepting personal causality.

Diagnosis involves finding out about my own theories in relation to the appropriate context. My students are current and prospective school educators and, therefore, the context for my practice is schools. Argyris and Schon (1974: 159) explain that a practitioner cannot be responsive to a situation by hearing about it or reading about it or theorising about it. The information can only be gained through interaction with others. My information was gained by interacting with practitioners in primary schools.

Practitioners must test their theories. During the course of the study I theorised about the meanings of some of the actions I observed and the stories that I was told. I needed to test these theories in the process of my own theory building. Argyris and Schon (1974: 160) point out that one of the problems in testing our theories is that we make assumptions that induce in others behaviour that supports our assumptions.

Robinson (1993) tests theories by asking for evidence of knowledge claims. She then asks for counter-evidence or contradictions to the theory. I will give an example. I theorised about why many of the practitioners in the study had not, by their own account, implemented environmental education in their classrooms. The story I was repeatedly told was that the curriculum was too crowded - there was no room in the curriculum for 'extras' such as environmental education. In a conversation with Viviane Robinson at the American Education Research Association conference in New Orleans (personal communication, April 6, 1994), she asked me to describe the major findings

of the study. My reply was that practitioners are not teaching environmental education because the curriculum is too crowded. She then asked me for contrary evidence. I provided her with evidence of practitioners who were implementing environmental education in their classrooms. Her question then was how satisfactory was my theory. I decided it was less than satisfactory and I developed a more adequate theory, that is practitioners are not teaching environmental education if they believe that it is not important in their classrooms. There are many and varied reasons why practitioners believe that the teaching of environmental education is not important in their classrooms.

If my own theory building is to improve my practice and in turn improve the practice of my students as practising teachers then I must take responsibility for my actions. I must understand that my actions are **causal** over other people's actions. This means I must value what I believe and be committed to those beliefs within my constraint structure. In this instance it is beliefs about the importance of environmental education in teacher education. My constraint structure is the policies and institutional organisation of the university. I must also consider the constraint structure of schools and the policies and organisation of schools.

Theories of environmental education in the school curriculum

The practitioners in this study held varied and often conflicting theories of environmental education. One way of explaining this conflict is to refer to a small 'e' and large 'E' view of environmental education. The 'e' environment consists of activities such as beautification of the school grounds while 'E' environment involves the integration of environment in the school curriculum. Each of the practitioners participating in the UTS Environmental Education subject held a 'E' environment view

and one which was based on a socially critical model of teaching environmental education. The problem for these practitioners was reconciling their 'E' theory of environment with the 'e' theory held by other practitioners and frequently their principals. It is the 'E' theory of environmental education that I now wish to discuss.

I ask whether environmental education is a distinctive kind of education (as suggested by, for example, Greenall-Gough, 1990) with its own pedagogies and epistemologies, then is it different from other aspects of the school curriculum? Does this view of environmental education alienate the field of study from other aspects of the curriculum? If it is a field of study with specific pedagogies and epistemologies how then can it be successfully integrated into other subject areas?

My answer to these questions is that environmental education is not distinctive and has the potential either to be taught as a separate unit, compatible with the school curriculum; integrated into specific curriculum areas; or treated as an interdisciplinary subject. Further, I argue that it is naive to believe that environmental education is likely to have a widely transformative function in school education. Important as environmental education is it has no greater claim on the school curriculum than any other area that will, in the long-term, produce a well-educated, socially responsible member of the community.

One argument is that it is the *for* the environment, or the action component (as interpreted by socially critical theory), which both differentiates environmental education from other curriculum areas and also requires practitioners to revise their theories of teaching and learning.

Some practitioners in the study, and especially those who had been students in the UTS Environmental Education subject, theorised about environmental education being more action oriented. They claimed that environmental education provided students with the opportunities to engage in solving environmental problems using a socially action research model. The issue that emerged, however, was that practitioners failed to see that they had involved their students in taking action. A student 'Joanne' , for example, felt that she had failed to implement environmental education in her classroom because, by her account, her students did not take action to improve the environment. The students investigated an important environmental issue but became frustrated because they could not make the changes necessary to solve the environmental problem they explored.

Joanne's experience suggested that I needed to redefine the action component of environmental education for my students. The new definition needed to cohere with practitioners' theories of teaching and learning and take account of their constraint structure. Clearly, the socially critical action research model was not appropriate

Building a better theory

Stories told by the practitioners in the study suggest that the strategies I had employed with my students during Phase I of the study would not lead to the changes I desired. Therefore, it was necessary to revise my theories. I needed an espoused theory of change and I needed to engage in actions to bring about change, that is have a theory-in-use that coheres with a revised espoused theory of change. I argue that my espoused theory of change and the strategies that I had been using to solve my problem, that is my theory-in-use, did not cohere with a theory of change that would solve my problem.

I argue that my previous espoused theory of change needed revising and a theory of action needed to be developed which provided strategies which would allow change to take place in schools. My espoused theory of change ignored the theories held by practitioners in relation to their current curriculum, the group norms that protect those theories and the organisational structure of schools which protects practitioners' theories and group norms. In short, my espoused theory of change ignored practitioners' constraint structure.

I provided my students with the knowledge and skills to implement environmental education in their classrooms and my expectation was that environmental education would be taught. What I had not considered was practitioners' constraint structure and in this way I had ignored their constraint structure.

Argyris and Schon (1974) speak of theories of practice as the set of theories that constitute certain practices. Here I needed to look at the set of theories that constituted my theory of teacher education practice. I am arguing that in my set of theories, I needed a theory of change that would solve my problem.

I needed to be able to provide opportunities for my students to reflect on their own theories of practice. They needed to examine their theories of action, particularly in relation to environmental education in the curriculum and to identify their constraint structure. It is important that they identify their problems and from there develop a theory of action that will solve their problems. In other words I decided that a problem-based methodology was a more effective theory and that I needed to introduce this theory into my teacher education subjects and in professional development programs for practitioners.

Conclusion

Through a study of my practice I was able to provide an analysis of teachers' theories of learning and teaching in primary schools, the conditions or constraints under which they work and students learn and their decision making about what is included in their classroom curriculum. I also questioned the research and theories which have influenced the field of environmental education. Moreover, in Phase I of the study, I was able to make distinctions between the set of theories that have influenced environmental education and my preferred set of theories. One outcome of the study was that I needed to question the theories that had dominated my teaching of environmental education. In my revised theory I found that a problem-based methodology accommodated the different theories held by practitioners and as a result had the potential to provide solutions to practitioners' problems.

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